

Chapter 4 : Data Management

Introduction

The Inyo-Mono IRWM Program strives to provide a central hub for water related data and information in the region. In a region of this size, water information is voluminous and can span over a century. Yet historically the sharing of this information has been difficult due to high political tension, geographic separation, rural technology challenges or just low prioritization.

The Inyo-Mono IRWM Program has created a platform for the sharing of these data and information through the development of the Regional Water Management Group, an Integrated Regional Water Management Plan, and a continually improving IRWM Program website. (<http://inyo-monowater.org/>)

Significant resources were invested in the Program and website development as a fundamental step in facilitating open communications among once silent stakeholders. From this grassroots effort, a Program has been built that has succeeded in bringing some much overdue funding for water projects to the region. With success comes an added responsibility to monitor the implementation of the IRWM Plan as well as meet more specific grant deliverables to ensure our regional planning efforts do not merely exist on paper.

This chapter addresses the requirements specified in the revised 2012 Plan Standards while at the same time reflects our regional data management needs and priorities.

Building an Integrated Regional Water Management Program

Once the Integrated Regional Water Management planning effort began in the Inyo-Mono region, the Program focus for data collection fell to assessing and addressing fundamental issues and needs of the newly established IRWM region. Data acquisition mirrored current needs and remained fairly basic in its extent, consisting of baseline stakeholder data and the beginnings of regional project needs list. As expected, minimal data collection, coupled with a small IRWM Program Office staff, equated to the low prioritization of an official data management program.

With the attainment of the first Planning Grant, the RWMG was able to hire additional staff that brought a complementary set of skills and helped continue to build the Program. Tasks for the new staff under the Round 1 Planning Grant included the development of an improved Program website as well as the creation of a land and water planning documents digital library that was hosted on the redesigned site. Additionally, the concept of an online project upload form was born and implemented, which in turn populated a Regional Project Needs Database.

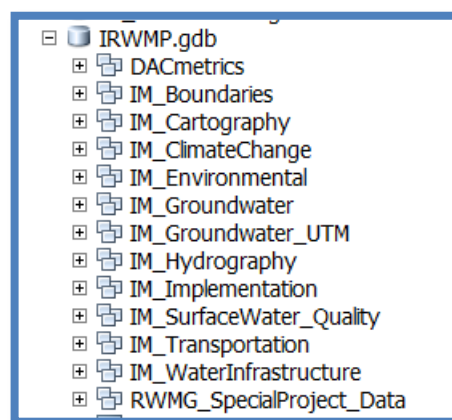


Figure 4-1: Organizational structure of Inyo-Mono file geodatabase

Additionally, a large amount of spatial data was given to the Program Staff by RWMG stakeholders upon the Inyo-Mono IRWM Program launch. Many of these data existed on hard disks with minimal record of the acquisition date, origin or other valuable metadata. Data were redundant, legacy and/or incomplete in many cases and were stored in differing projections and datums, which commonly lead to alignment issues of the data thus necessitating the need for skilled GIS personnel to make basic maps. To remedy this situation, the Program Office has worked steadily to consolidate a plethora of disparate spatial data into a file geodatabase. This effort purged redundant or legacy datasets, and reorganized and reprojected all datasets using the same spatial reference information. This effort resulted in a new hierarchically organized IRWM Program file geodatabase and contained feature datasets for each major category deemed necessary by the Inyo-Mono Program (Figure4.1).

Data Management System & Information Sharing

The Water and Land Use Planning Documents Digital Library, the Regional Project Needs Database, and the newly-developed IRWM Program Geodatabase provide the building blocks for the Inyo-Mono Data Management System (DMS). The 2012 Guidelines and the revised data management plan standard repeatedly refer to a DMS for regional data sharing and organization. Given that the DMS itself is not defined by DWR, it leaves the function, architecture and purpose of the DMS open to regional interpretation. With that, the Inyo-Mono IRWM Program has analyzed regional data availability, data needs, current finances, and the future of the IRWM Program to come up with a DMS that is economically feasible, meets our regional needs, and addresses the current plan standards.

Thus the Inyo-Mono DMS is being organized into three distinct segments, each of which the data sharing capabilities are outlined in *blue italicized text*.

- Spatial data will be housed in the aforementioned Inyo-Mono **IRWMP geodatabase**. The advantage of the geodatabase is that all spatial data are kept using a standard datum (NAD 83) and projection (UTM Zone 11 N) for the region. This allows for less experienced GIS users to easily and quickly generate one-off map products in a timely manner without needing advanced troubleshooting knowledge of common GIS alignment issues that arise with poor metadata.

File geodatabases are easy to zip and email to stakeholders or other interested parties and leave little room for alignment issues due to metadata ambiguity as is common when sharing independent ESRI shapefiles.

- Land Use and Water Planning documents are voluminous in a geographic area this large. Thus, electronic versions of relevant planning documents are housed on the Inyo-Mono IRWM Program **digital library**. This allows for a centralized location for all stakeholders and interested parties to learn more about both land use and water planning efforts in the region. The development of this library has helped stakeholders become familiar with planning documents relevant to their community, organization, or project area. This format also allows for low-cost maintenance and is simple to update frequently changing documents.

The majority of the planning documents are available for download from the library. However, some larger planning documents file sizes make housing the document on the Inyo-Mono website prohibitive, in those instances; documents are linked to the parent site.

- Aspatial data will be housed in a traditional **Microsoft Access Database**. Currently, these data are scattered in abundant Microsoft Excel or Google spreadsheets and other document formats. The need for a comprehensive database to consolidate all these data has been known for some time, and work has begun to design and build an Access Database for these aspatial components. By choosing Access, the finished database will provide an efficient way to define, create, query, update, and administer program level data. Access databases can also readily accept exported data from ArcGIS products, and conversely table objects from the database can also be imported and joined to assigned spatial components within ArcGIS.

An Access database can be easily attached via an email to interested parties who can then apply more advanced queries for increased performance of the data if needed. Further, specific tables of data can be easily published to the web via .html or .pdf files or exported to Excel for integration into statewide databases or other program databases that use Excel. At an additional cost, the Access databases can also be shared via a Microsoft Sharepoint site if the need for server-based data applications arise in the future.

The database will provide a user-friendly interface using custom forms, queries, and reports to input and analyze program data. Data validation rules and input masks will be applied at the design level to ensure data quality assurance and control measures are in place and that data input into the database meet baseline quality control and assurance parameters.

Initial database design is underway. Full implementation of the Access Database will be completed as part of the Round 2 Planning Grant.

With these fundamental tools in place, the Program will be poised to better meet the data and information needs of our stakeholders.

Data Needs within the IRWM Region

While the Inyo-Mono IRWM Program has been able to make considerable strides in the area of data acquisition and management, it is not surprising in a geographic region of this size that substantial data gaps remain.

Challenges of Census data in Rural Areas

One primary challenge is the fact that U.S. Census data are not available for much of the region, or they are inconsistently available, even within individual Census-designated communities. Only 46 of the 73 locally recognized communities within the region are even recognized by the U.S. Census bureau. This makes understanding basic demographics more difficult, as we begin to explore patterns and trends of data throughout the region.

Large Water/Energy Utilities Unable to Prioritize Participation

A secondary challenge is that the Los Angeles Department of Water and Power, as well as Southern California Edison, remain intermittent in their IRWMP participation. These two entities hold a vast amount of water and environmental data that is only available to the public where mandated by law. An immense amount of their data remains proprietary and leaves a large gap in our understanding of both surface water and groundwater and well as the water-energy nexus in the Inyo-Mono region. Without these two major players, it is

difficult to fully integrate all of the water management efforts in the region. The Inyo-Mono IRWM Program staff and stakeholders continue to explore ideas of how to engage these valuable stakeholders.

Military Lands

Two major military inholdings operate within the boundaries of the Inyo-Mono IRWM Region. The first is the Marine Corps Mountain Warfare Training Center, which is located 21 miles north of Bridgeport in Pickle Meadows, CA. This military installation has been in operation since 1951 and currently supports billeting facilities for some 1200 training personnel not including permanent staff. Another 111 offsite homes are offered at the Lincoln Military Housing Area in Coleville, CA.

The second installation is the China Lake Naval Air Weapons Station, northeast of Ridgecrest, CA. “China Lake is the United States Navy's largest single landholding, representing 85 percent of the Navy's land for weapons and armaments research, development, acquisition, testing and evaluation” (Wikipedia, 2014) Though largely undeveloped, infrastructure on the base includes over 2,000 structures, hundreds of miles of roads, and a transient population of some 9,500 service men and women.

The geographic footprint and assigned personnel on these military installations and their associated strain on water resources within the region are recognized. Frequent changes in military staff make it challenging to maintain reliable contacts at the various bases. Efforts will continue to acquire data and establish communications with these military units to promote coordination and fill the gaps of water resources knowledge within the region.

Climate and Ecological Data

Because of the region's vast size and relative isolation with respect to urban centers in California, the climate and ecology of the region are relatively poorly-understood compared to other parts of California. A recent increase in research interest in the region is helping to fill in data gaps. Similarly, few climate change forecasts have been developed specifically for the region or areas within the region (see Chapter 3 for a further discussion). This lack of forecasting information complicates water planning activities.

Local Monitoring Efforts

It is known that numerous entities within the RWMG as well as those who remain more distant from IRWM planning activities collect routine water quality and flow data. To date, efforts to consolidate this information have not been initiated for a number of reasons. Primarily, the RWMG has chosen to focus on meeting critical water infrastructure needs which are abundant. Given the laborious nature of participating in IRWM planning activities, and project prioritization, local water monitoring data consolidation has not been a priority. In the future, it would be ideal to be able to house data from those efforts in the Inyo-Mono GIS as well as the Access Database.

Available Data

This section outlines the data available and used by the Inyo-Mono IRWM Program to help answer questions and share information about our region.

Stakeholder Data Contributions

As with most regional water management groups, the stakeholders in the Inyo-Mono region are enormously diverse, ranging from small Community Service District representatives, local and federal government organizations, non-profit groups, and large urban water and power utilities. Given that diversity, the amount, quality and types of data generated and contributed from each of these stakeholders vary dramatically. This section provides a brief summary of the types of data available from our stakeholders.

Mono County

The Mono County GIS department is the most comprehensive geospatial data contributor in the region. Their website hosts a robust online data center that provides geospatial data files for the majority of public data they manage. Esri shapefiles (.shp) files are available for download from this site at no charge, with the exception of some of the Mono County imagery collection. Imagery, because of its large file size, is available by regular mail on DVD for a small fee. Data from this site are limited geographically to Mono County and the Town of Mammoth Lakes. (<https://gis.mono.ca.gov/site/data>)

Inyo County Water Department

The Inyo County Water Department (ICWD) monitors the vegetation, soil water, and hydrology of the Owens Valley to help manage groundwater exports by the City of Los Angeles. ICWD assists in the implementation of the County Policy on Extraction and Use of Water. Inyo County and the LADWP use this information to jointly manage the Owens Valley's water resources under the Inyo/Los Angeles Water Agreement. ICWD also advises the County on other water resource issues in Inyo County. (<http://www.inyowater.org/>)

The ICWD has recently completed a much needed overhaul of its website, which now provides a rich source of data and information specific to the Owens Valley and its water resources. The site houses a variety of documents, legal agreements, reports, and data, all of which revolve around the joint management of water resources in the Owens Valley. In many instances, these documents are also linked in the digital documents library on the Inyo-Mono Program website. (<http://inyo-monowater.org/resources/library/>)

Kern County

The Kern County Water Agency (Agency) maintains a robust relational database that can store data relating to groundwater, surface water, hydrologic conditions and well production, and well construction for Kern County. The Agency also maintains GIS applications that are provided to Indian Wells Valley Cooperative Groundwater Management Group in the form of groundwater elevation maps, watershed conditions, geological information, cadastral, population, and assessors' data.

San Bernardino County

The portion of San Bernardino County that lies within the Inyo-Mono Region is by far the least populated and developed portion of that County as well as within the Inyo-Mono Region. Thus, data availability for this area is limited compared to its surroundings. Further efforts need be employed to seek out available data for this sector of the planning area. Initial communications with San Bernardino County officials indicate that our local

knowledge of the section of the region contained within San Bernardino County may be greater than any data the County has on file.

Los Angeles Department of Water and Power

As mentioned above, the LADWP works with Inyo County to manage the water resources in the Owens Valley. LADWP also manages additional water resources near Mono Lake in central Mono County. Due to its significant water interests, LADWP has monitored hydrologic and weather conditions in the eastern Sierra for over 100 years. More recently, LADWP has been required to produce numerous reports and environmental documentation as part of the various legal agreements that have been put in place to ensure that local resources are protected while providing water to the City of Los Angeles.

Data that are required to be made publicly available are housed on the LADWP website and linked through several other sites. Hydrologic data include real-time flow data, daily Los Angeles Aqueduct reports, precipitation conditions, Lower Owens River Project (LORP) flow and monthly reports, and current weather conditions along the aqueduct. Additionally, LADWP performs their own snow surveys to better forecast summer water supplies.

(https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-water/a-w-losangelesaqueduct/a-w-laa-laaqueductconditionsreports?_adf.ctrl-state=d3wzwp62_64&_afLoop=896665869580153)

Further extensive environmental documentation is provided on the revised LADWP website, including annual reports and planning documents for the Owens Valley that address various subjects such as endangered species preservation, drought recovery, and groundwater pumping effects on vegetation.

(https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-water/a-w-losangelesaqueduct/a-w-laa-environmentaldocumentation?_afWindowId=null&_afLoop=894895328073699&_afWindowMode=0&_adf.ctrl-state=tztl7wcmc_17#%40%3F_afWindowId%3Dnull%26_afLoop%3D894895328073699%26_afWindowMode%3D0%26_adf.ctrl-state%3Dd3wzwp62_17)

In many instances, these data are also linked from the Inyo County Water Department website directly to LADWP's website so that the County does not have to maintain the voluminous data source. The same is true for the Inyo-Mono IRWM Program website where many of the water planning documents can be found.

Mono Lake Committee

The Mono Lake Committee has worked for decades toward the preservation of healthy lake levels for this unique landlocked saline lake in central Mono County. The committee has a membership of approximately 16,000 concerned citizens who work together toward the protection of this resource. In doing so, the committee maintains a website for public outreach as well as a data center known as the Mono Basin Clearinghouse. The clearinghouse contains a wealth of data and reports specific to the lake, including raw data, historical documents, legal transcripts, current research, relevant chronologies, and a link to state-level GIS data sources. (<http://www.monobasinresearch.org>)

Mammoth Community Water District

The Mammoth Community Water District has been a keystone stakeholder in the Inyo-Mono RWMG, actively participating in nearly every component of the planning process. Additionally, the District manages a strong in-house GIS and water quality data

management program from which they have generously shared data. The District has provided both aspatial and spatial data and served in an advisory role with respect to data management and organization. They also work closely with the GIS departments of Mono County and the Town of Mammoth Lakes. As a result, water-related data for the town of Mammoth are comprehensive, well organized, and readily available.

United States Geological Survey

The United States Geological Survey (USGS) provides a comprehensive suite of water quantity, and in fewer instances, water quality data throughout the region. These data can be accessed using the National Water Information System (NWIS) online database. (<http://waterdata.usgs.gov/nwis>) An abundance of surface water, groundwater, and water quality data may be obtained from this website.

For the last 100 years, the USGS has explored groundwater resources throughout the region, leaving behind a network of monitoring wells that provided various levels of groundwater elevation data. Historically, this network contributed valuable groundwater data from 387 well locations in Inyo County and 133 in Mono County (Figure 4-2 USGS, NWIS, 2012). Currently, the majority of these wells sit idle and no longer provide groundwater data to the region. For specific USGS wells, monitoring may have been discontinued for a number of reasons. In some cases, monitoring responsibilities were transferred to other entities. Other monitoring efforts ceased due to decreases in funding or completion of specific projects of limited time and duration.

National Water Information System (NWIS) databases include all past monitoring locations. Upon initial discovery, the data are deceiving with regards to current data availability within the region. Of the total USGS-owned wells given in the database for Inyo and Mono Counties (520 wells), only a small percentage (30 wells or 5%) have continued to serve as monitoring wells within the region (USGS, 2012). The comparative maps that follow (Figures 4-2 and 4-3) were created to illustrate the loss of data collection capacity as well as infrastructure associated with USGS and other efforts.

During the past decade, even fewer USGS monitoring data have been collected. At present, only two USGS monitoring locations are providing consistent groundwater data within the region (Long Valley Caldera study area: USGS Well # LV19, 4S28E1F1M and USGS Core Hole #CH10B, 3S29E30E2M; USGS, Personal Communication, 2012).

The extent of USGS surface water gauging stations is also reduced from past efforts. In the past, there existed 47 USGS stream gaging stations in Inyo County and 36 in Mono County, all which contributed surface water information for the region. Due to downscaled funding within the USGS, those surface water gauges currently collecting data have been drastically reduced, leaving only two in Inyo County (both on the Amargosa River) and less than a dozen in Mono County, all of which are concentrated in a few locations: Bridgeport Valley, East and West Walker Rivers, and the critical streams near Mammoth Lakes (Figure 4-4). Some historical USGS gauges in Owens Valley have been transferred to LADWP. Although the USGS stations yield predominantly flow data, on rare occasions some sites have water quality data available (USGS, Personal Communication, 2012).

Figure 4-2

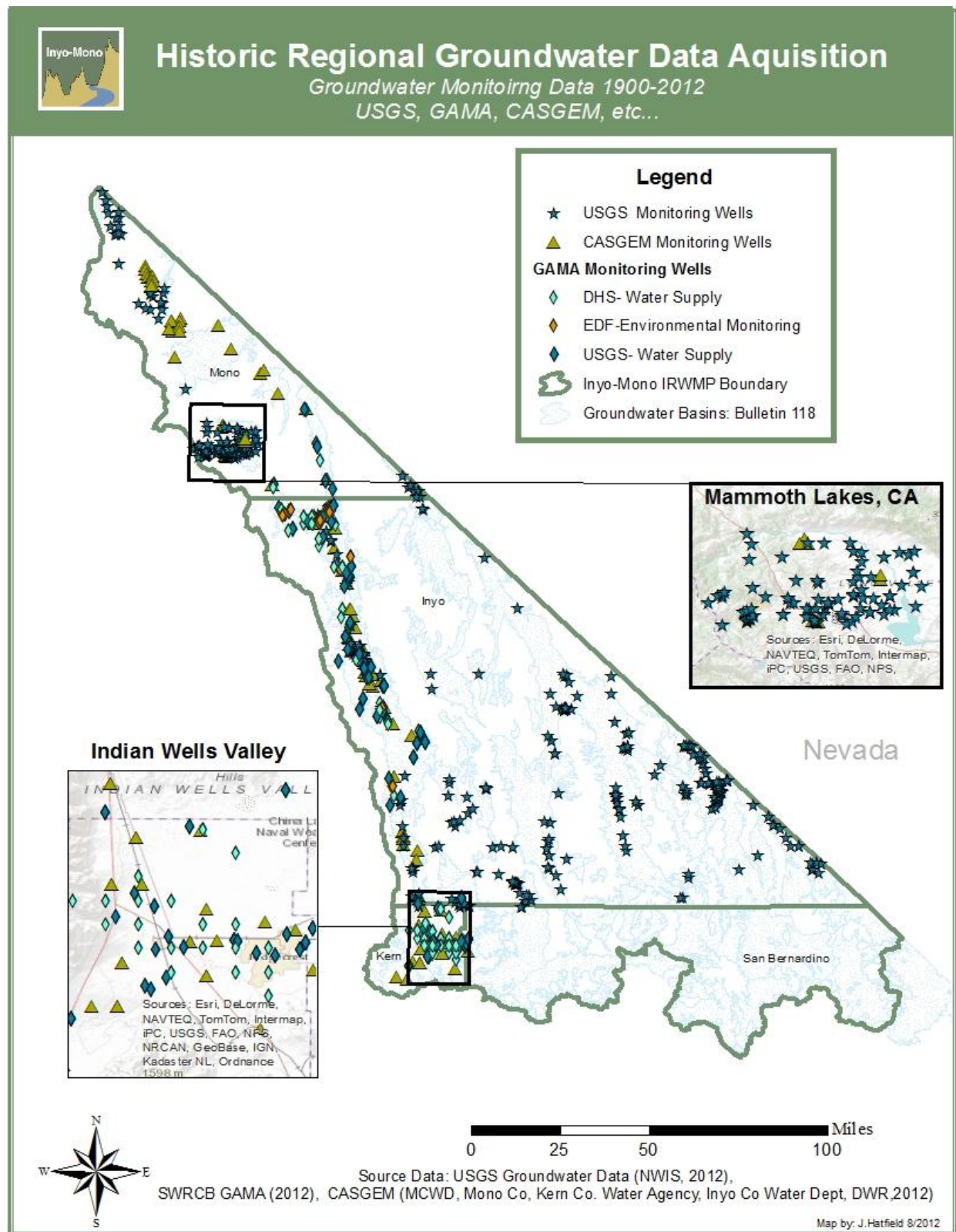
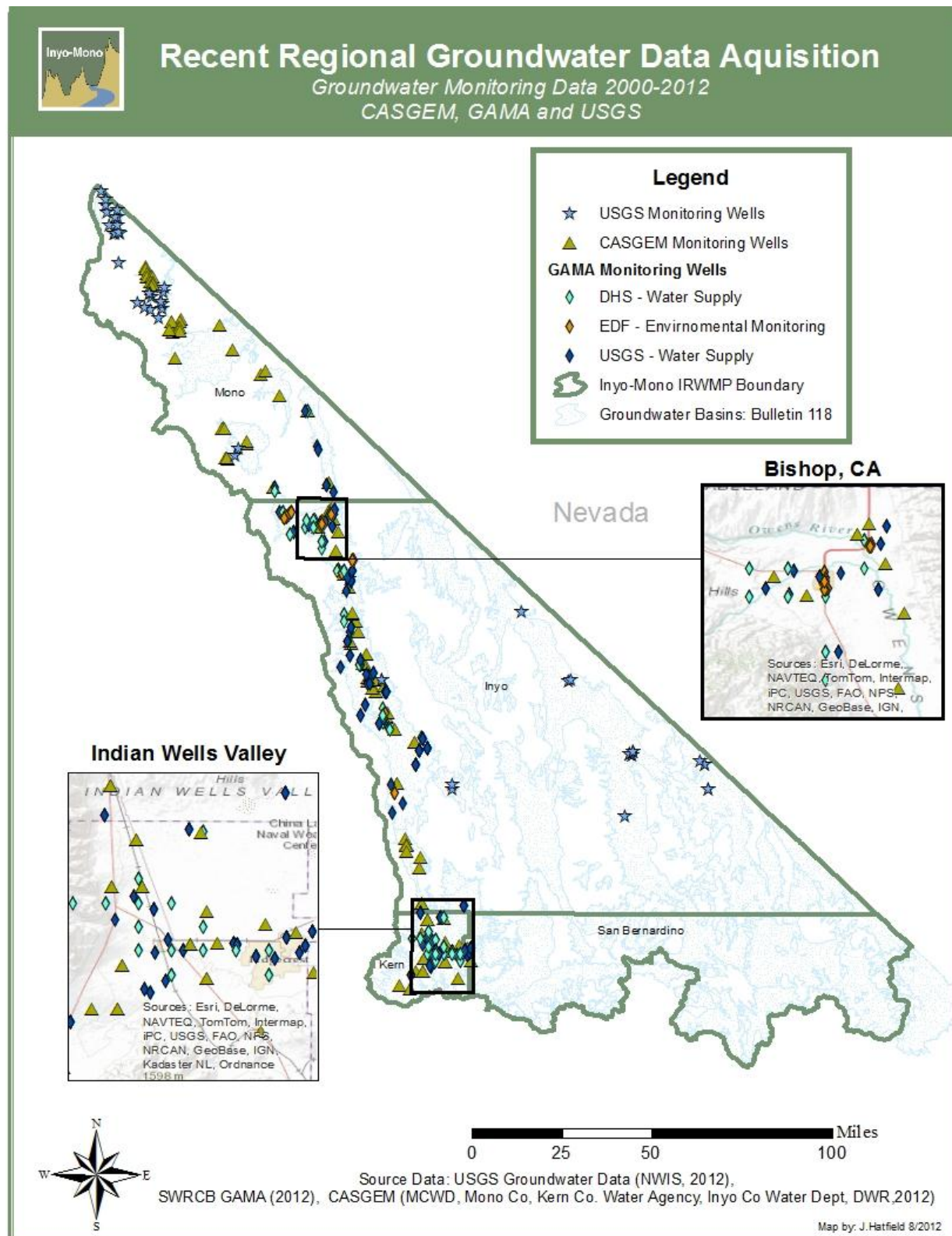


Figure 4-3



United States Forest Service

Federal data are also quite important given the percentage of federally managed lands within the region. The Inyo National Forest in particular contributed environmental and boundary data to the Inyo-Mono IRWM Program. In addition some USFS national efforts have generated watershed specific data for the region.

Watershed Condition Framework

The Watershed Condition Framework leverages work done by the USFS to evaluate watersheds managed in full or part by the USFS. The USFS analysis utilized basins described by their 12-digit hydrologic code, which is a nationally standardized naming convention designed by the USGS to identify watersheds at various levels. “The Watershed Condition Framework (WCF) is a comprehensive approach for proactively implementing integrated restoration on priority watersheds on national forests and grasslands” (USDA, 2011a). The report recognizes the watershed as a fundamental component of broader ecosystem health and was designed for the USFS as a first step in a larger six-step watershed restoration process. As a first step, each watershed was evaluated against the Watershed Condition Framework using the Watershed Condition Class_assessment, and one of three classes was assigned to each watershed: Class 1=Functioning Properly, Class 2=Functioning at Risk, or Class 3=Impaired Function:

(http://www.fs.fed.us/publications/watershed/Watershed_Condition_Framework.pdf
http://www.fs.fed.us/publications/watershed/watershed_classification_guide.pdf/)

An ArcGIS Online map has been provided by the USFS to promote integration of this effort with other planning efforts. The Inyo-Mono IRWM Program has utilized that map to create a version specific to the Inyo-Mono Region as a way to further promote integration of information. (<http://inyo-monowater.org/wcf-map/>, <http://apps.fs.usda.gov/WCFmapviewer/>)

Of local significance, the Oak Creek and Deadman Creek watersheds were selected as priority watersheds by the Inyo National Forest as a result of its collaborative work on the Watershed Condition Framework. Consequently, the USFS, in partnership with the Fort Independence Indian Reservation, received a Prop. 84 planning grant award in the amount of \$75,000 to begin a Stream Rehabilitation and Stabilization Study for the Oak Creek Watershed

Forests to Faucets

The USDA Forests-to-Faucets project “uses GIS to model and map the continental United States land areas most important to surface drinking water, the role forests play in protecting these areas, and the extent to which these forests are threatened by development, insects and disease, and wildland fire. The results of this assessment provide information that can identify areas of interest for protecting surface drinking water quality. The spatial dataset can be incorporated into broad-scale planning and can help identify areas for further local analysis. In addition it can be incorporated into existing decision support tools that currently lack spatial data on important areas for surface drinking water” (USDA, 2011c).

(http://www.fs.fed.us/ecosystemservices/FS_Efforts/forests2faucets.shtml)

Again, capitalizing on work already performed by the USFS, the IRWM Program has provided an ArcGIS Online version of the USDA Forests-to-Faucets map to bring regional

relevance to the work done by the USFS in the region. Key scores to high-ranking watersheds are also provided in summary beneath the map on the provided web page. (<http://inyo-monowater.org/forest-to-faucets/>)

The Surface Drinking Water Index map layer gives particular weight to mountain/headwater regions in recognition of their role in providing high-quality drinking water to distant urban regions, giving considerable weight to a number of HUC-12 watersheds in the Inyo-Mono region. High scores indicate greater importance to surface drinking water.

Table 4-1:USDA Forest to Faucets: Surface Drinking Water Importance Index

USDA Forest to Faucets: Surface Drinking Water Importance Index for Inyo-Mono Region Watersheds	
Watershed (HUC-12)	Score
Goodale Creek-Owens Valley	97
Grant Lake	97
Mammoth Creek	96
Rush Creek	95
Convict Creek	93
South Fork of Bishop Creek	93
Hot Creek	92
Dry Creek	91
Lake Crowley-Owens River	91
Oak Creek	91

DWR

CASGEM

The California Statewide Groundwater Elevation Monitoring (CASGEM) Program was initiated by the State legislature's SBX7-6 in 2009 to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. Groundwater elevation monitoring was scheduled to begin in 2012 and is to be done by local entities that are approved as Designated Monitoring Entities by DWR. The CASGEM program has already begun to generate valuable groundwater data within the region. Currently, local entities are strategizing as to how to fund such programs within already restricted budgets, while fully realizing the value of the potential data generated within the CASGEM program. CASGEM groundwater data being collected both within the region and throughout the State are available through DWR's Water Data Library. (<http://www.water.ca.gov/waterdatalibrary/>)

CASGEM's approved Designated Monitoring Entities within the Region include Inyo County, Los Angeles Department of Water and Power, Indian Wells Valley Cooperative Groundwater Management Group, Tri-Valley Groundwater Management District, and Mono County (a conditionally approved Monitoring Entity as of January 2012). Continued efforts are being made to prioritize expanded CASGEM efforts within the region.

(http://www.water.ca.gov/groundwater/casgem/designated_entities.cfm)

Climate Change

Over the past decade, there has been an increasing amount of climate change information and data available to California water managers. Although DWR does not directly collect many climate change-specific, the data it does collect and house (such as CASGEM) will be helpful to IRWM practitioners moving forward. However, DWR has worked to become a resource with respect to climate change and regional water management. In 2011, DWR, in cooperation with the EPA and the Army Corps of Engineers, released the Climate Change Handbook for Regional Water Planning (EPA 2011), which provides guidance to regional water management groups performing climate change analyses for their regions. In addition, DWR has made four staff members available to IRWM regions to help provide climate change information and resources. More recently, DWR's Climate Change Technical Advisory Group has been charged with developing a set of recommended global climate models for use by DWR and other water planning entities and will release these recommendations by the end of 2014.

State Water Resources Control Board

Major data collection and monitoring programs spearheaded by the State Water Resources Control Board (SWRCB) include the Surface Water Ambient Monitoring Program (SWAMP) and Groundwater Ambient Monitoring and Assessment Program (GAMA).

GAMA

"The GAMA Program was created by the State Water Board in 2000. It was later expanded by Assembly Bill 599 – the Groundwater Quality Monitoring Act of 2001. The main goals of GAMA are 1) to improve statewide groundwater monitoring, and 2) to increase the availability of groundwater quality information to the public" (SWRCB, 2012a) (http://www.swrcb.ca.gov/water_issues/programs/gama/)

Data collection for the GAMA program in many instances began before the program's "official" start in 2000, with data available for the Inyo-Mono Region from as far back as 1984 (SWRCB, 2012b). Live, online data resulting from the GAMA Program can be retrieved for a handful of monitoring wells located within the region through the SWRCB geotracker link below, although downloadable data appear to be more complete. (<http://geotracker.waterboards.ca.gov/gama/>)

Also available through the GAMA website are groundwater basin water quality assessments from the CA Groundwater Bulletin 118 updates for all California counties. Of interest to the Inyo-Mono Region are data for Inyo, Mono, Kern, and San Bernadino Counties: (http://geotracker.waterboards.ca.gov/gama/gamamap/public/gama_reports.asp?county=INYO)

SWAMP

The SWRCB also leads an extensive surface water quality (SWAMP) data collection effort that can be accessed through the California Environmental Data Exchange Network (SWRCB 2012c; CEDEN, <http://ceden.org/>). Within the Inyo-Mono Region, there are approximately 68 stations that collect or have collected SWAMP data, the majority of which were parts of studies conducted by the University of California Sierra Nevada Aquatic Research Laboratory from 1999-2007. Station locations are concentrated mainly on the Walker River and Mammoth Creek/Hot Creek with additional outlying stations dispersed throughout the region.

Figure 4-4 below details surface water quality data (SWAMP), and Figure 4-2 details groundwater data (GAMA) currently available from within the regional boundaries from the SWRCB.

IRWM Program Data

Additional IRWM Program-generated data that will contribute to the Inyo-Mono Data Management System's Access database as well as the IRWMP geodatabase are summarized below.

Stakeholder Involvement Data

At its inception, the Inyo-Mono Program began collecting basic stakeholder information, which formed the basis of Program-level data. These data included stakeholder contact information and MOU signatory status, stakeholder attendance at RWMG and committee level meetings, and attendance at capacity-building workshops and trainings. These data also include participation in Plan and Project review processes. Thus these data are indicators of the level of involvement of a particular stakeholder.

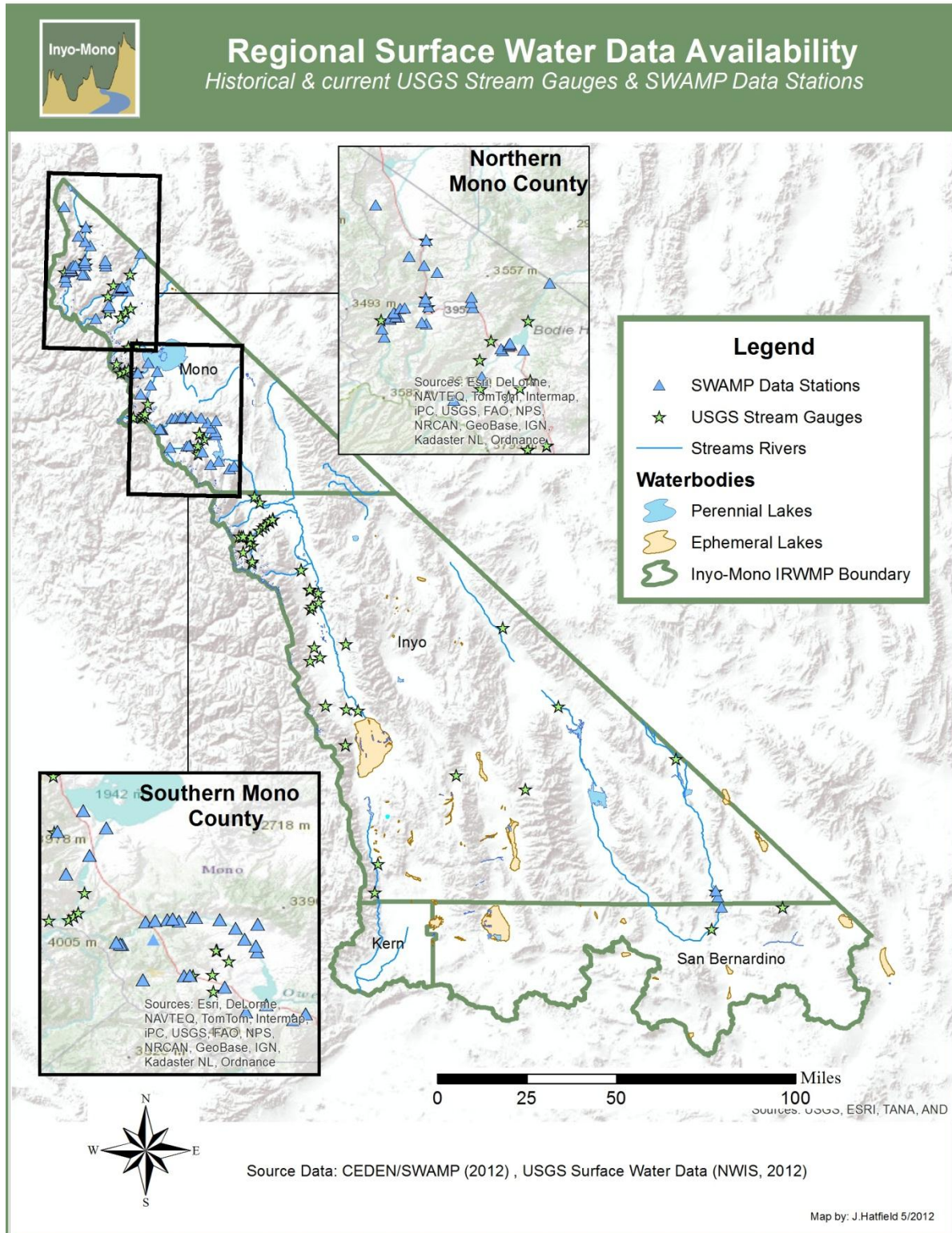
Census Data

As the program grew, baseline Census level data were obtained to begin to study the region's demographics in order to better focus aid and outreach, and to identify disadvantaged communities. Immediately, we understood that Census data were limited in what they could teach us given that 36% of the population centers of the region are not represented in Census surveys. Also included within this category are American Community Survey data, which are generally collected on a more frequent schedule than decennial Census data.

Outreach Effectiveness Data

As the Program grew and grant funding was secured, the Inyo-Mono Program was able to significantly ramp up outreach efforts, particularly to the more remote, smaller, and/or more disadvantaged communities. Hours of travel and a variety of communication methods were employed to seek out much needed information that could begin to fill gaps in our understanding about the water needs of various geographies in the region. Included in these efforts were multiple open-house events, one-on-one meetings with water systems and other stakeholders, individual water system needs assessments and surveys, and consistent follow-up communications aimed at collecting information about Plan objectives and resource management strategies, water-related regional issues, project needs, training deficiencies, and water system-specific information. These efforts were documented in various ways, including calendars, agendas, and meeting notes.

Figure 4-4



Regional Project Data

The Phase I Planning effort yielded a list of 101 project needs in the Inyo-Mono Region. Fifteen of these projects were submitted in the Round 1 Implementation Proposal, of which seven received funding. Further, three additional projects were granted funding through the Round 2 Planning Grant as planning studies. Information on the 101 projects was collected through the use of a spreadsheet submitted to the Program from individual project proponents.

For second Implementation Round, an online project upload form was designed to ease the administrative burden of Program Staff, as well as to feed directly into the Program's Regional Needs Database. Stakeholders were asked to submit projects still viable from the initial list of 101 projects, as well as any new projects they wished to be eligible for the second implementation round. This process ultimately led to a reduction of projects, which is likely attributable to the increased amount and specificity of information required by the online upload form, together with stakeholder skepticism and fatigue following the Round 1 Implementation application process. These projects make up the Regional Needs Project Database (Appendix XX) and include basic project information such as cost, scope, and timeframe as well as relation to Inyo-Mono IRWM Plan objectives and RMS.

Small Water Systems Data

The Inyo-Mono Region contains over 200 small water purveyors. These water systems vary in size, governance, need, and capacity. At the outset of the IRWM planning process, small water system information was recognized as a significant data gap. Through our partnership with California Rural Water Association and US EPA's Safe Drinking Water Information System (SDWIS), we were able to acquire fairly comprehensive data about the systems in our region. Once assembled, these data were shared with respective County Environmental Health departments whose data were also lacking prior to IRWM Program development.

Using the list of about 200 water purveyors, we circulated (online and through U.S. mail) a Small Water System Needs Survey to water managers and operators. This survey was designed to ascertain respondents' level of concern on a number of issues, learn about planning challenges systems may be facing, as well as determine how systems analyze and interpret routine regulatory water samples. Data from this survey helped the IRWM Program select the most "needy" water systems to receive needs assessments from the CRWA. The data were also used to bring a select number of strategically-targeted trainings to the region at no cost to participants while also allowing them to earn continuing education units for their attendance.

Project/Plan Performance and Monitoring Data

With the acquisition of implementation funding comes the need to evaluate projects against their own project-specific monitoring plans as well as against IRWM Plan Objectives and RMSs. To this end, and to monitor IRWM Plan implementation, a Project Performance Checklist was created in 2014. An excerpt of this checklist can be found in Chapter 13: *Plan Performance and Monitoring*. The checklist evaluates project accomplishments using both outcome and output indicators based on the performance measures agreed to in the Implementation Grant Agreement. Additionally, the checklist gives project proponents

flexibility to add any monitoring they already perform under other regulatory or voluntary conditions. Lastly, the checklist evaluates projects against Inyo-Mono IRWM Plan objectives and requests the identification of Resource Management Strategies employed to realize said objective. Data from this checklist will be input into the Program database and used to chart Inyo-Mono Plan Implementation.

Figure 4-5: Small Water System Online Survey

General Water System Information

What is the name of your water system? *

Is your water system currently operating under permit? If so who is the permit issued by

☐ Not currently permitted
☐ California Department of Public Health
☐ County Environmental Health Department
☐ Other:

Does your system have a Water Operator? If so, please indicate below his/her certification level.

☐ No Water Operator
☐ Level 1
☐ Level 2
☐ Level 3
☐ Water Operator but no "official" certification
☐ Other:

Who analyzes your water quality samples?

Check all that apply

☐ Water Operator
☐ Other Staff/Board member
☐ Outside consultant
☐ Local or State government official
☐ No samples taken/water not tested
☐ Other:

Who interprets your water quality results?

Check all that apply

☐ Nobody
☐ Water Operator
☐ Other staff/board member
☐ Outside consultant
☐ Local/State government official
☐ Other:

Is your water source intake achieved through ground water (wells), surface water or both

☐ Groundwater
☐ Surface Water
☐ Both
☐ Other:

Please indicate the level of concern for your system on the following topics:

	No Concern	Limited Concern	General Concern	Moderate Concern	Extreme Concern
Water Quality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inadequate water supply for drinking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inadequate water supply for fire protection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inadequate water pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aging infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inadequate wastewater infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inadequate staffing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Storm water and flood protection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sustainable Capital Improvement Funds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Are your current rates sufficient for building capital improvement funds and covering operating and maintenance costs?

☐ Yes
☐ No

Implementation Project Data

Additionally, the Program has created a project monitoring page on its website that aggregates valuable information learned through the implementation process. On the page are quarterly invoice reports, final reports, completed feasibility studies, lessons learned, and vendor information for all different phases of the project. (<http://inyo-monowater.org/implementation-round-1/project-reporting-monitoring/>) Eventually, the Program hopes to turn this part of the website into a go-to resource for first-time IRWM project proponents.

Downscaled Climate Modeling Data

The Inyo-Mono IRWM Program has worked to generate its own information on climatic changes, impacts, and adaptation options specific to the Inyo-Mono region. Perhaps the most robust information generated thus far are the climate model output summaries for six sub-regions within the IRWM region. These summaries show projections of temperature and precipitation over the coming century using several climate models and greenhouse gas emissions scenarios (see Chapter 3). That we know of, these are the only climate change projection analyses that have been performed at this scale within the region. Similarly, we have developed a vulnerability analysis and an impact assessment based on the unique features of water management in the Inyo-Mono region. The Program will continue to seek out information from climate modelers, agency climate change staff, and local water managers regarding climate change and its impacts in the Inyo-Mono region.

Data Acquisition Methods

From a purely organizational perspective, building on regional IRWMP data is much easier now that the Inyo-Mono geodatabase is in place. Yet data scarcity remains a formidable barrier for the Inyo-Mono Program. This section outlines the primary methods of data acquisition in the Inyo-Mono region in the recent past.

Fundamental Program Data

Day-to-day program efforts contribute to program-level data. Meeting attendance and summaries, stakeholder correspondence, outreach efforts, new contacts, and revolving funding opportunities, along with other types of data, accrue at a fairly consistent rate. These data are currently stored in Excel or Word files managed by Program Office staff. In the future, these data will be input into the IRWM Program Access Database via user-friendly forms to ensure data integrity and database accuracy.

Survey-Level Data

A major source of new data has arisen through the use of surveys of various kinds. Staff have performed field surveys, mailed out paper surveys, and circulated electronic surveys to gain much needed information about small water systems, projects, disadvantaged communities, and training needs within the region.

Emerging Tools & Data

At random intervals, tools with relevant data for the region will be discovered through the professional community, online research, or academia. Examples of these tools include climate models and mapping tools that provide a wide range of outputs relevant to water

resources in the region. We have implemented a number of these tools to help us bridge data gaps for the region as well as to assist in our own downscaled climate models and research. Many of these tools provide downloadable data that can be leveraged with our Inyo-Mono IRWMP geodatabase to help broaden the scope and ensure completeness of this resource.

An example of such a tool is the Cal EPA Environmental Health Tracking Program's Water Boundary Tool. The open source online web mapping application sought to collect water service area boundaries for all public water systems in the State of California. The Inyo-Mono region as a whole has poor location information on service area boundaries. Working with CDPH and local environmental health departments, we engaged with stakeholders to learn basic computer skills needed to work with the tool and upload data. http://www.ehib.org/page.jsp?page_key=61 Inyo County has the large majority of its systems input into the tool, but accuracy remains an issue. Data for these systems are easily downloaded via the web and have been input into the IRWMP geodatabase.

Data Management Responsibility

At present, the Inyo-Mono IRWM Program has hired a GIS/Data Management Coordinator who is solely responsible for the management and distribution of Program-level data for the region. Management of other water-related data generated by other organizations remains the responsibility of the parent organization. In a region of our size and limited resources, the current practice is the only feasible way to manage water related data.

Long term viability of a data management program remains a central concern to the Inyo-Mono IRWM Program. Present data generation, collection, and maintenance efforts have been possible through Proposition 84 planning grant awards. The current limited horizon of those funds jeopardizes the investment in data management the Inyo-Mono Program has made. At this time, Inyo-Mono stakeholders have been reluctant to increase their commitment to IRWMP-related work, citing the already intensive time commitment many Member representatives have in their organizations' duties. Thus the reality of a stakeholder organization adopting the data management portion of the Program upon loss of programmatic funding is unlikely and risks a loss in the investment in integrated regional water management planning in the region. Regardless, the digital library, file geodatabase, and Access database will work in unison to preserve institutional knowledge of progress made thus far in the event a gap in funding is encountered.

Data Quality Assurance and Control Measures

With heightened momentum in a data management program, the need for quality assurance and controls became immediately obvious. In response, a Data Management Plan (DMP) was created for the Inyo-Mono IRWM Program. This plan outlines best practices for spatial data creation, acquisition, and management to ensure that the sharing of data is met with a baseline level of confidence. The DMP also articulates how the Access Database will improve data quality through the use of validation rules and input masks as well as a well-designed user interface for non-technical database users.

Further, the plan creates a standardized file naming convention for Inyo-Mono Program aspatial data files so that file names are easily recognizable, sortable, and dated for all internal Program documents. The complete Data Management Plan is available in [Appendix XX](#).

Data Compatibility

The request from the Department of Water Resources for IRWMP regional data compatibility with State databases like CEDEN, CASGEM, CEIC, CERES and the WDL is a tall order. These databases each require unique data standards, specific vocabulary, and often complex formatting for data submission.

For surface water and groundwater quality projects, data will be submitted to such databases as required by the grantor. Where required, project data that are prepared for submission into statewide databases will be seamlessly consumable by the Inyo-Mono Program's Access Database. This will preserve the data in required format for the appropriate statewide database, while enabling the Inyo-Mono Program to integrate the data into queries and reports for regional analyses.

Fortunately, data from these statewide databases can easily integrate into the Inyo-Mono Access Database due to the ease of importing Excel data into Access or alternatively using the data as an external data source. Similarly, State programs such as CASGEM that export data as ESRI shape files can be downloaded and reprojected in the Inyo-Mono File Geodatabase as a new feature dataset. Subsequently, the tabular components of those data can easily be imported into the Access Database to be used in creating queries, forms and reports and for other local analyses.

Currently the Inyo-Mono Access Database is designed to use the State Drinking Water Information Systems (SDWIS) data as an external table to create queries that match public water systems with funding opportunities within the database. The advantages of linking statewide data externally to the database include improved performance and the preservation of data management responsibilities at the State level.

Conclusion

The data segment of the Inyo-Mono IRWM Program has recently been gaining traction due to consistent programmatic funding for planning in the region. Given the lack of a large well-funded entity providing financial support to planning and programmatic efforts, the Department of Water Resources financial support has been vital to this effort. Data collection, organization and sharing have evolved from a few basic Excel spreadsheets to a full three-part Data Management System.

The Inyo-Mono DMS has been designed to preserve institutional knowledge in the event of a funding gap, meanwhile organizing three main types of related data and information relevant to the local IRWM effort. This organization allows for straightforward sharing of information with stakeholders, other regions and the State by providing the data in common software packages that are standard in the industry. By utilizing these three components (File Geodatabase, Access Database, and Digital Library) data updates and maintenance are relatively quick and inexpensive. Data in this type of system does not require those outside the region to learn an entire new system to access data, thus facilitating the sharing of our regional information with others.